

# Sound Hardware DIY Workshop – Day 1

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# Goals

- Learn the basic practical skills related to DIY audio
- Study some of the core concepts of electronics as a whole and sound-related electronics in particular
- Build a fun noisy device!

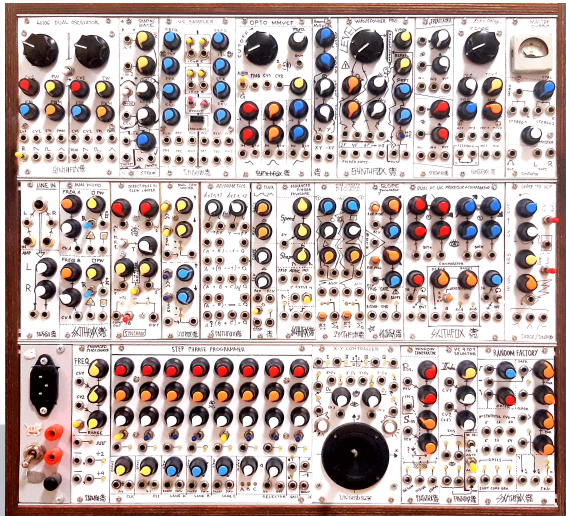
# Why learn all that

- You can find schematics and layouts of interesting devices online
- In order to build one, you need knowledge
  - Practical: part types and values, assembly techniques, ...
  - Theoretical: how & why it works, why it doesn't work for you, ...
- When you know that, you can build **anything!**

# Who

## Me

- Aubery Lis
- Making music since 2010, synths since 2016
- Runs [sfcs.neocities.org](http://sfcs.neocities.org)
- Made this thing



## You

- Name, pronouns, etc?
- Why are you here?
- Did you ever solder?
- What do you expect to gain from the workshop?
- *Say "pass" if you don't wanna talk*

# Plan

## Day 1:

- General discussion
- Breadboard basics
- Parts, values, schematics

## Day 2:

- 40106 oscillator
- Veroboard basics
- Assembly start

## Day 3:

- Assembly end
- Debug
- Jam session?

# Nature of sound

**What is sound?** How are acoustic and electronic sound related? What can be considered a synthesizer?

**How can we make electronic sound?** What do we need to transmit it to people's ears?

# Electronic components

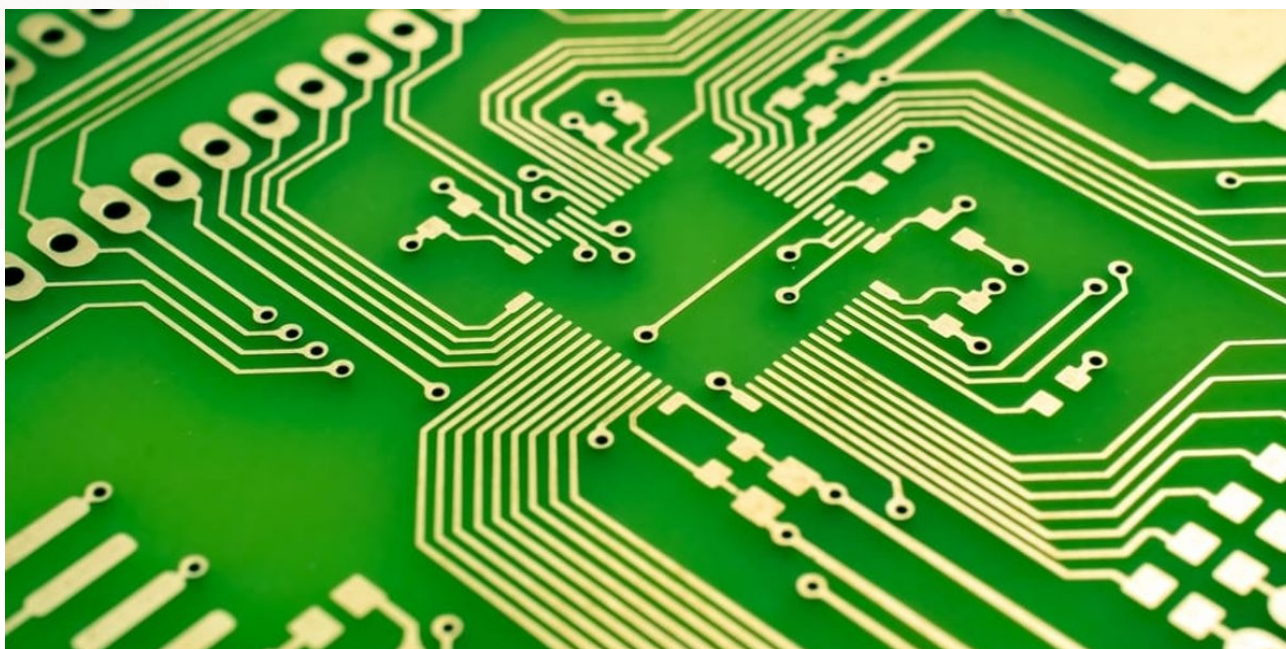
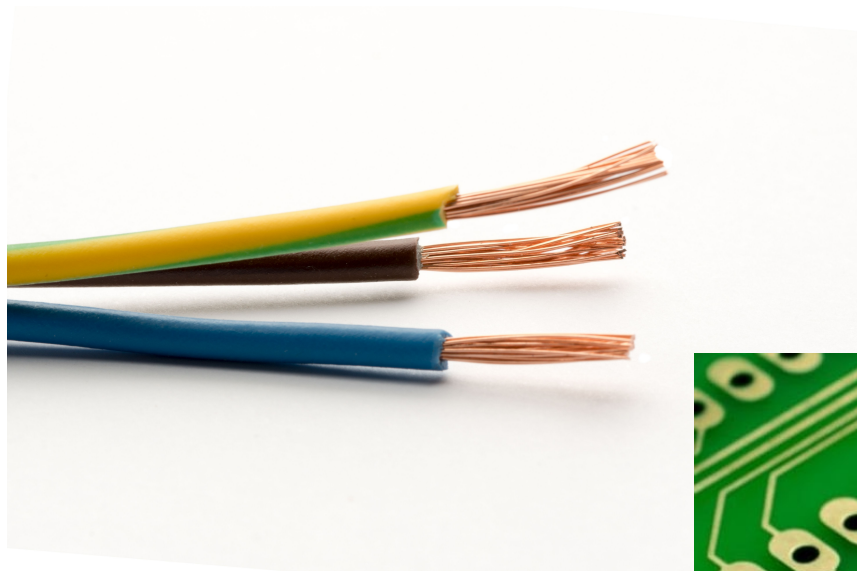
- Circuits are comprised of separate electronic components
- There are many types of electronic components: resistors, capacitors, inductors, diodes, transistors, ... ..
- The components have “inputs” and “outputs” called **pins** – many components are connected pin to pin to form a specific “mesh” of components
- Such “mesh” is called an electronic circuit

# Electronic components

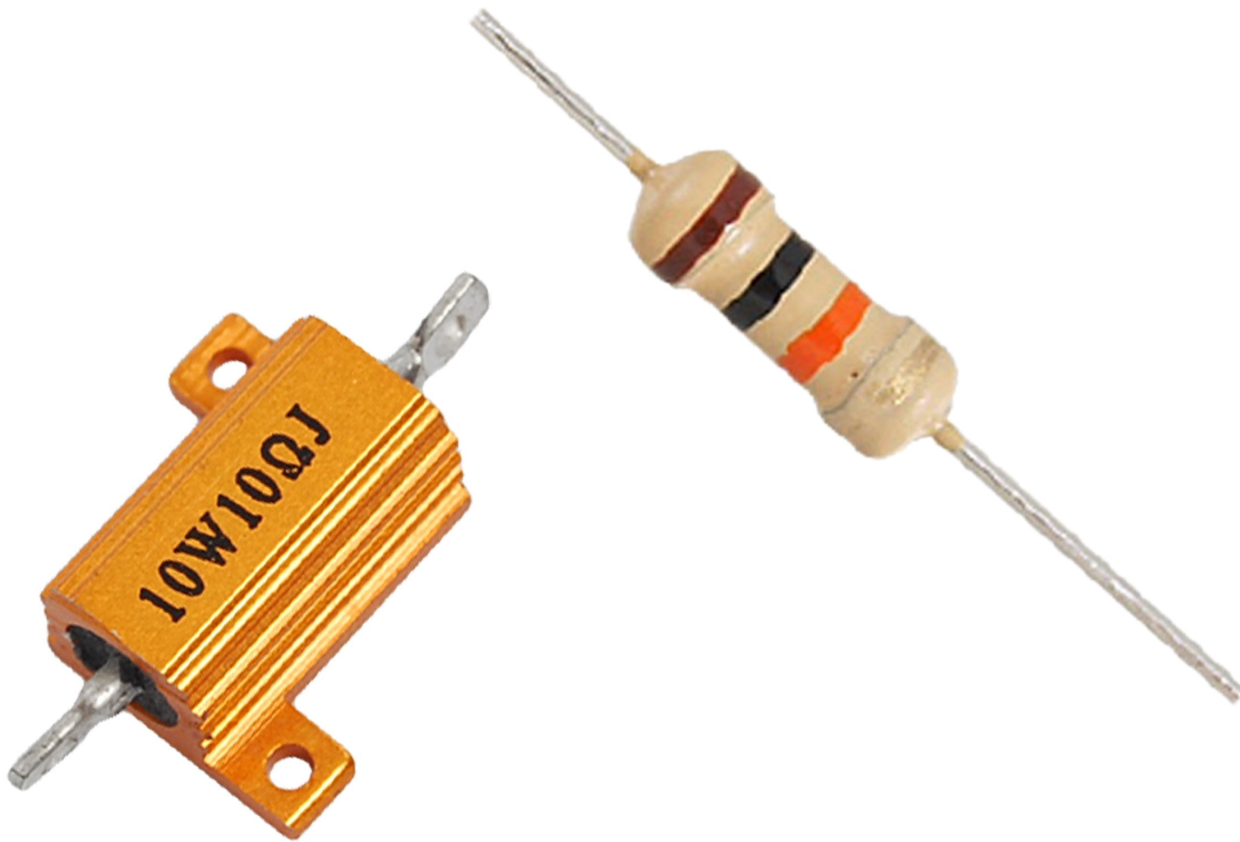
- A circuit's blueprint (which components are used and how are they connected) is called a **schematic**
- Other names include: circuit diagram, principal diagram, ...
- Each component has an associated symbol to be used in a circuit schematic
- When you see a schematic of a guitar pedal, it tells you how to assemble this guitar pedal yourself!



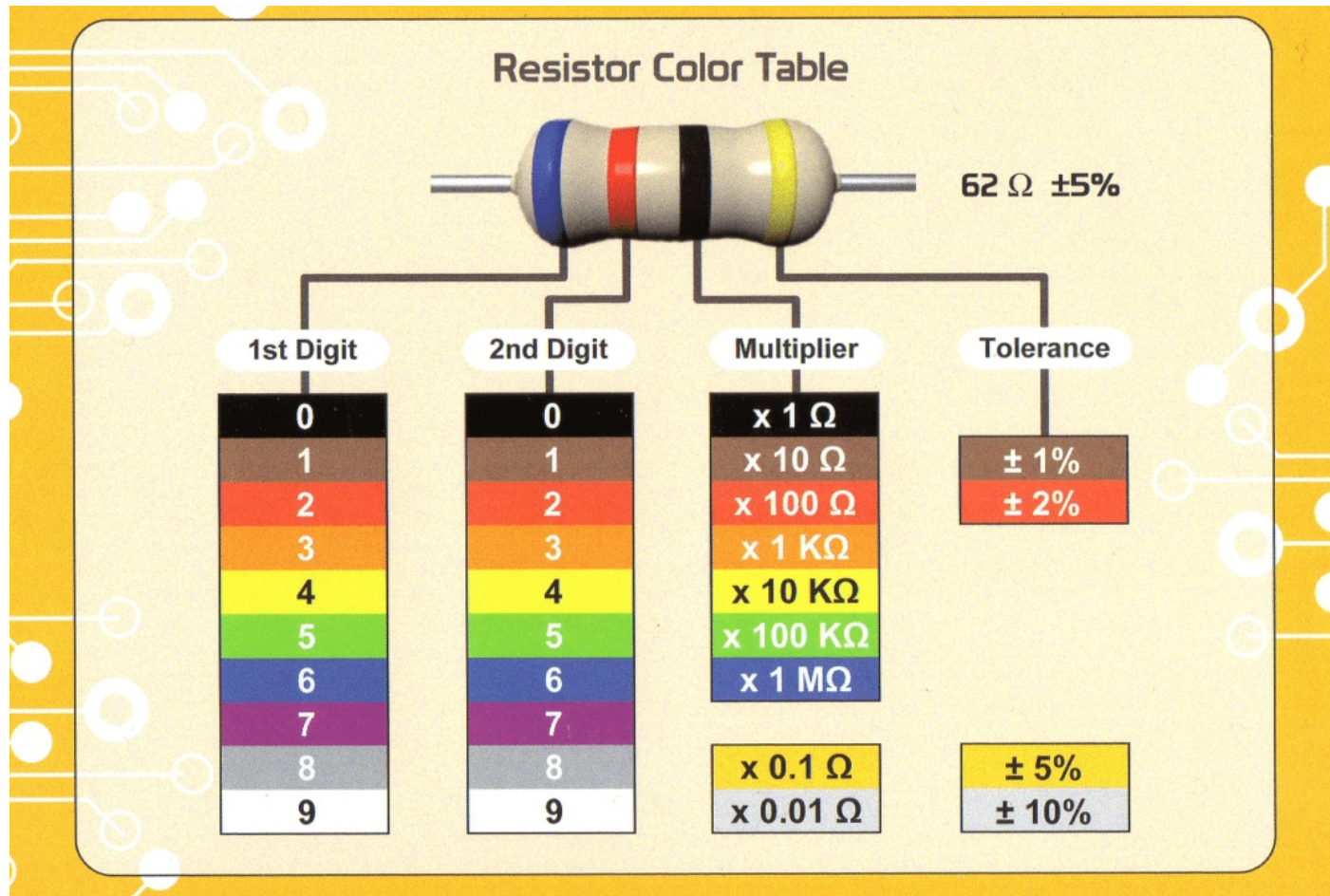
# Wire



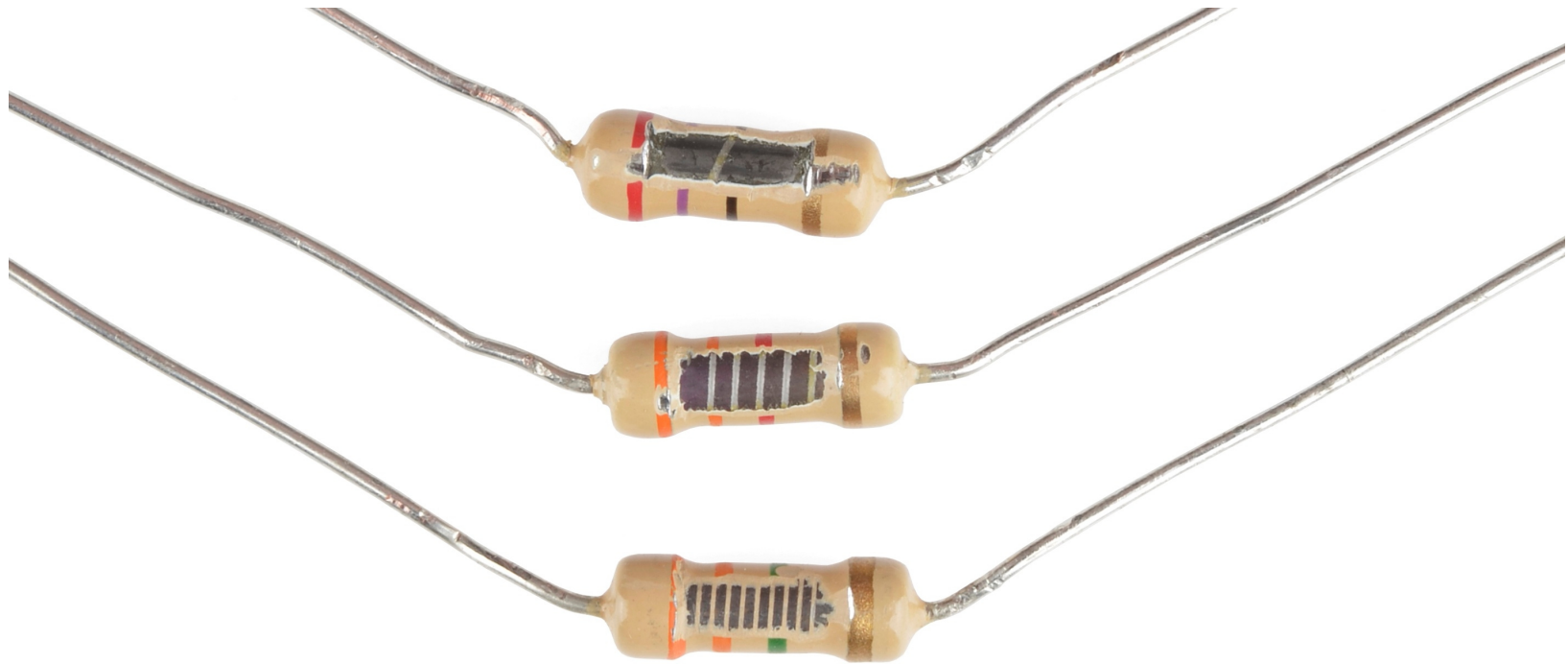
# Resistor



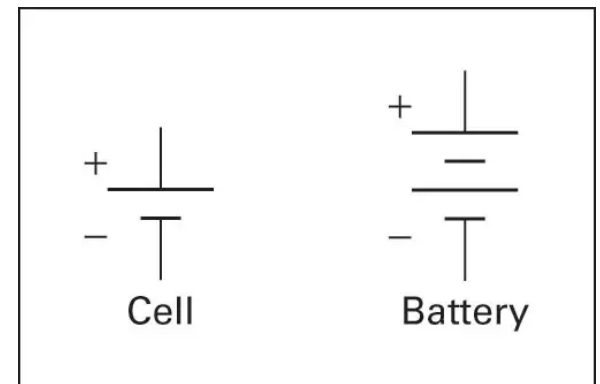
# Resistor



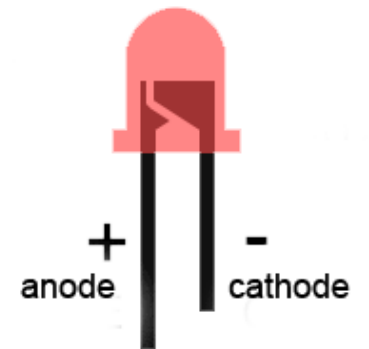
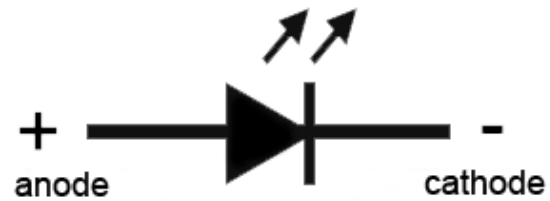
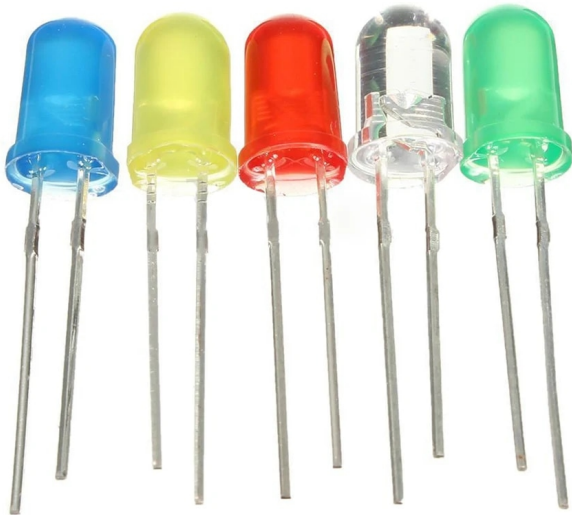
# Resistor



# Battery



# LED



**PANIC:** Positive – Anode, Negative Is Cathode!

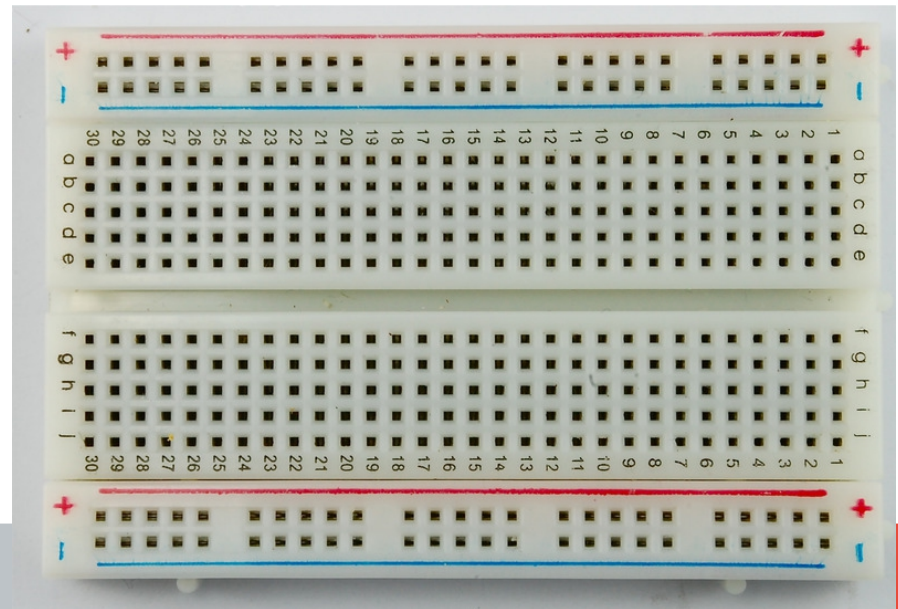
# Your first circuit

Let's use the components we just learned about and their symbols to draw a schematic and assemble a circuit!

Try a 1K resistor first. How different is 10K? 100K?

# Your second circuit...

- If circuits all were just chains of components, one after another, the alligator clip method would still suffice
- They, however, are not! Circuits branch, have sub-circuits, and so on...
- The solution to prototyping complicated circuits are **solderless breadboards!**

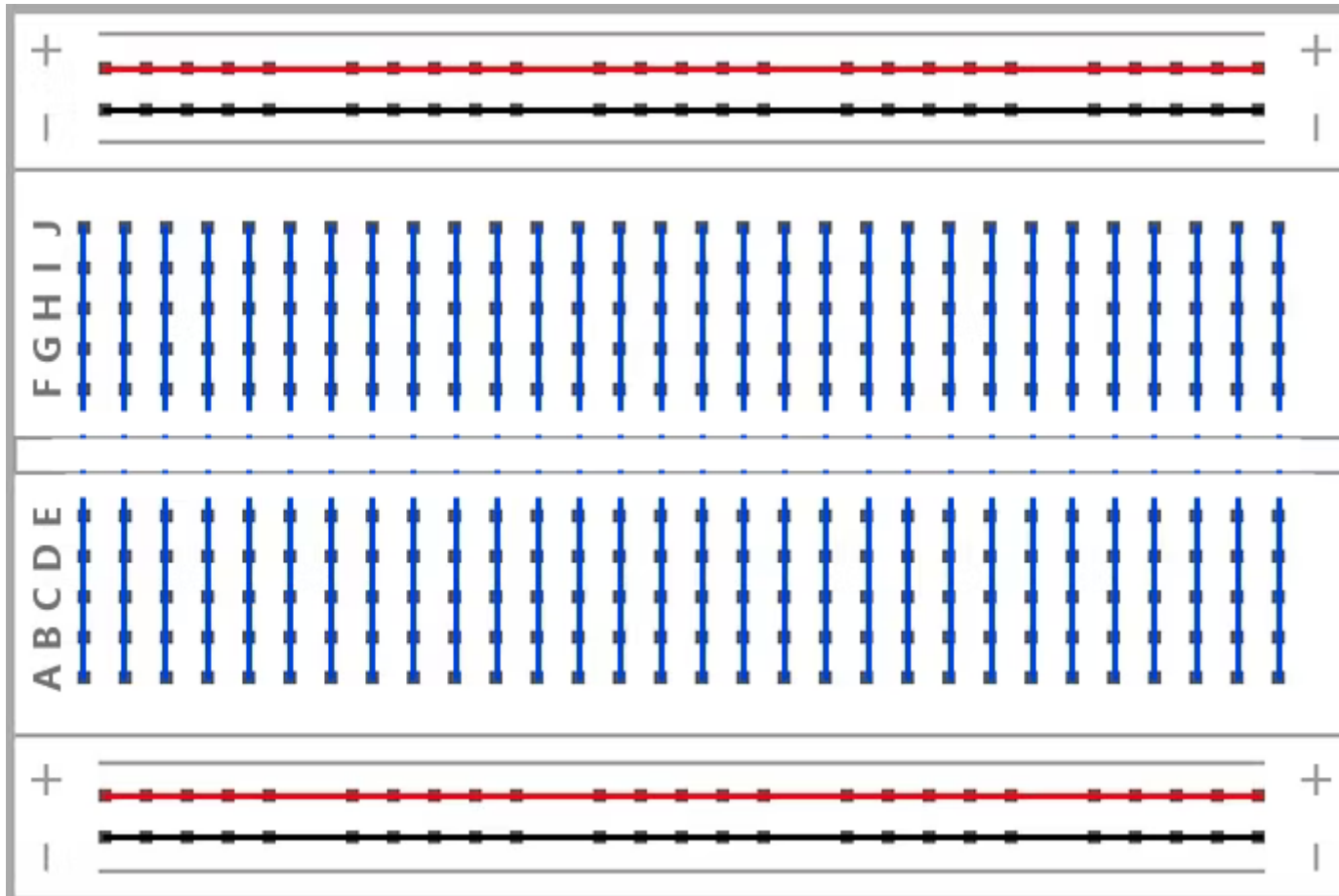




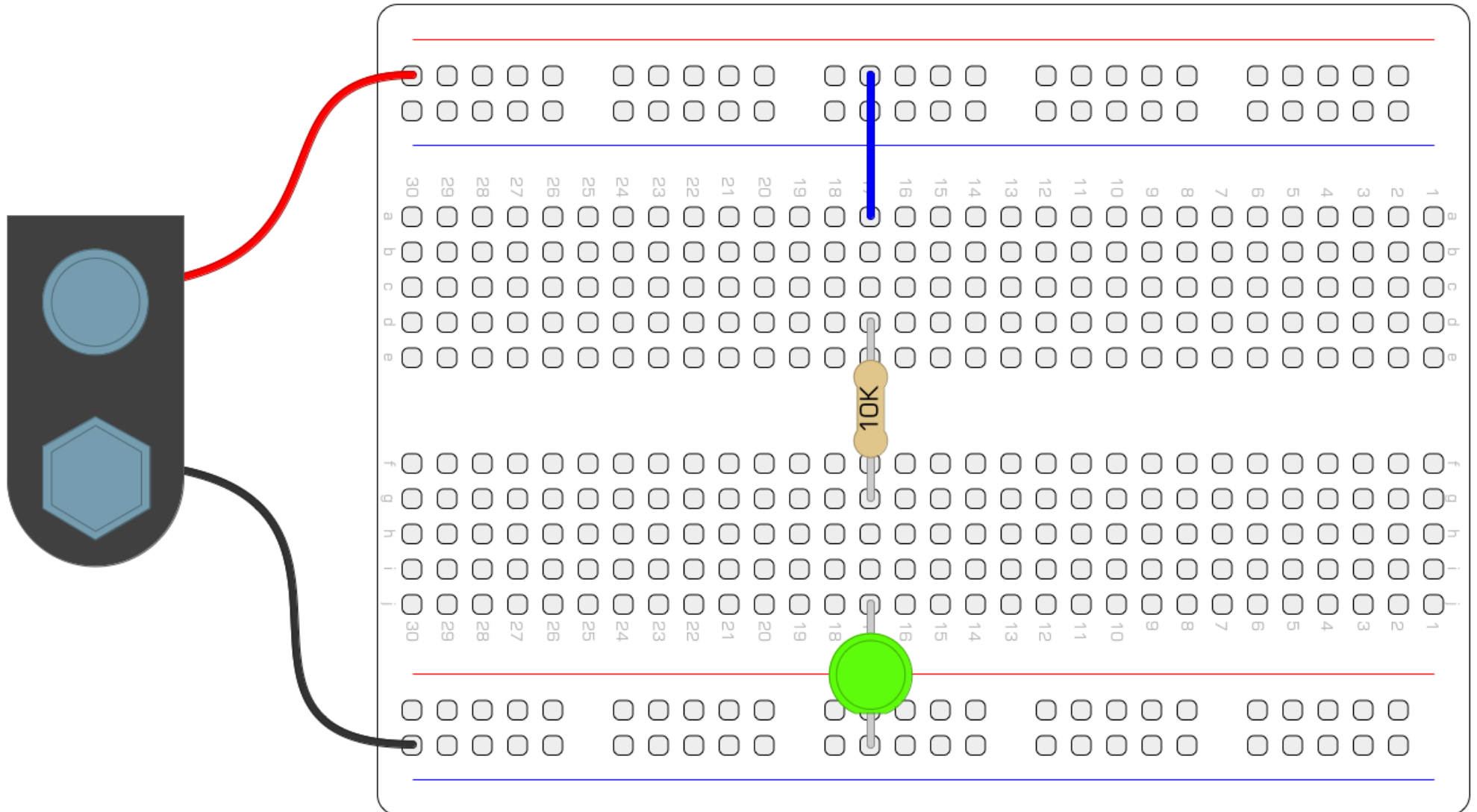
# Breadboards

- Come from actual bread cutting boards
- Radio enthusiasts would put nails in them and tie components to the nail, composing circuits
- These days, solderless breadboards are an off-market item that fits most modern through-hole components
- Breadboards make testing out your ideas a breeze!

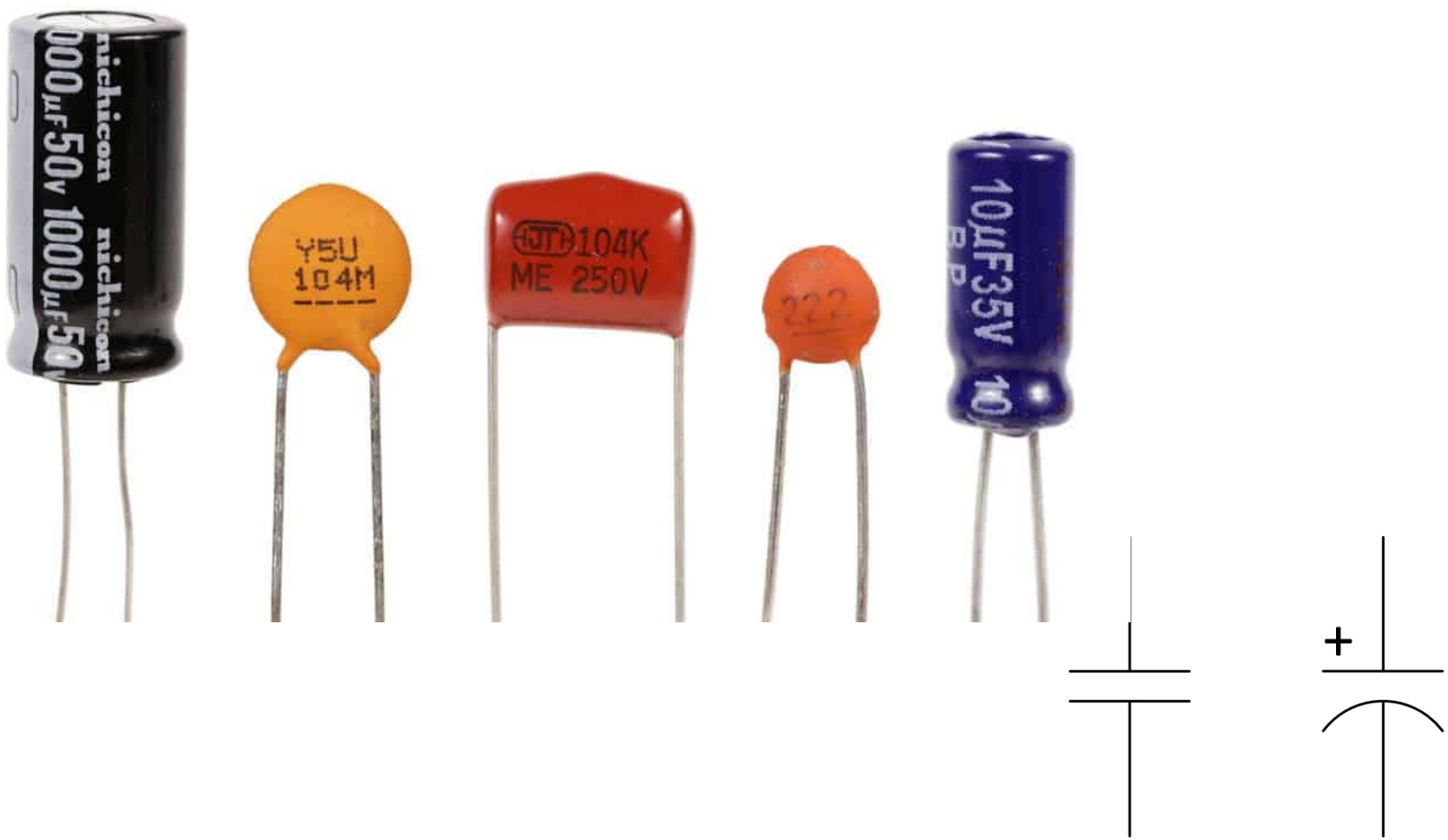
# Breadboard



# Replicate your first circuit on a breadboard

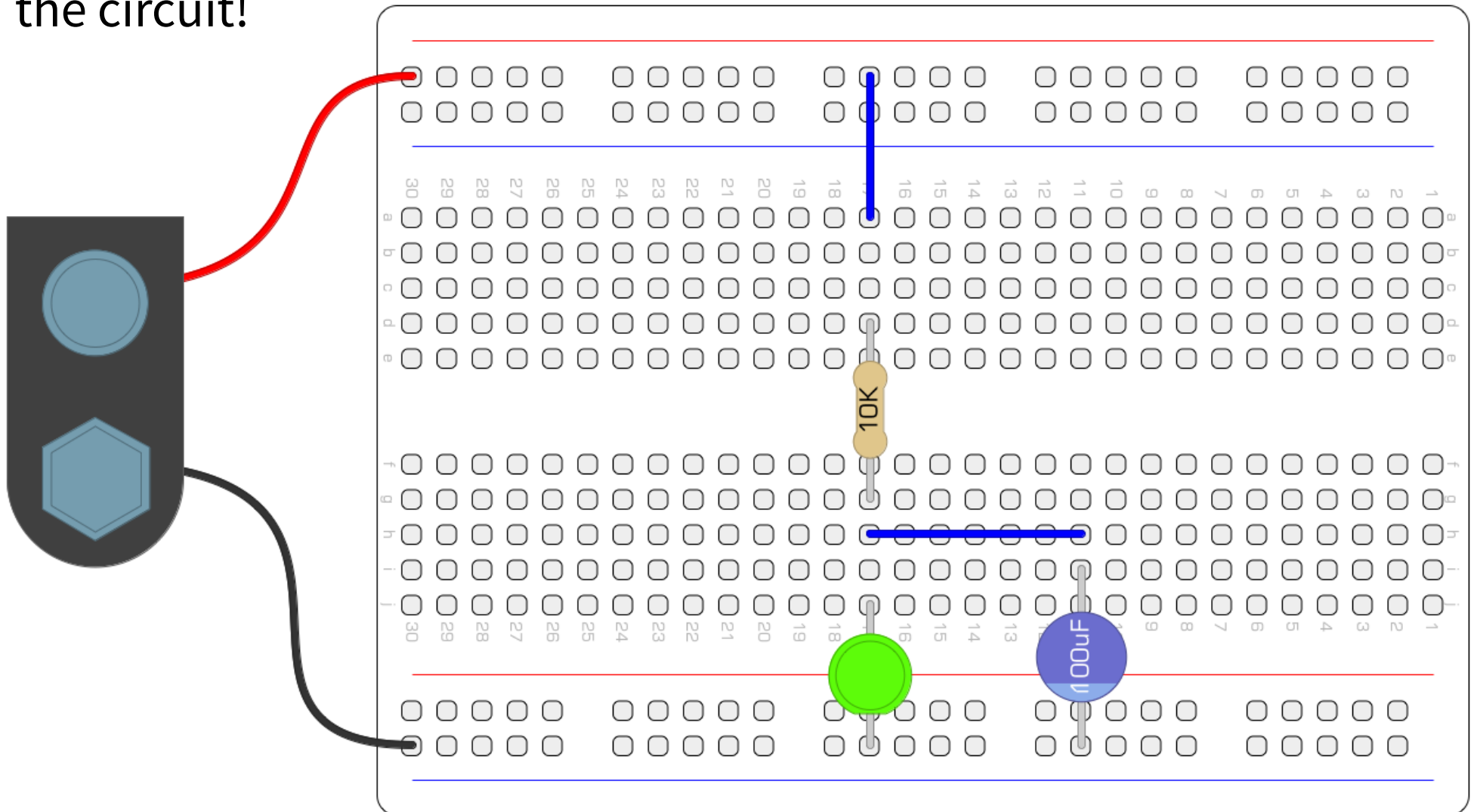


# Capacitor



# Add a capacitor to your circuit

Try different capacitors and resistors! Reconstruct the schematic from the circuit!



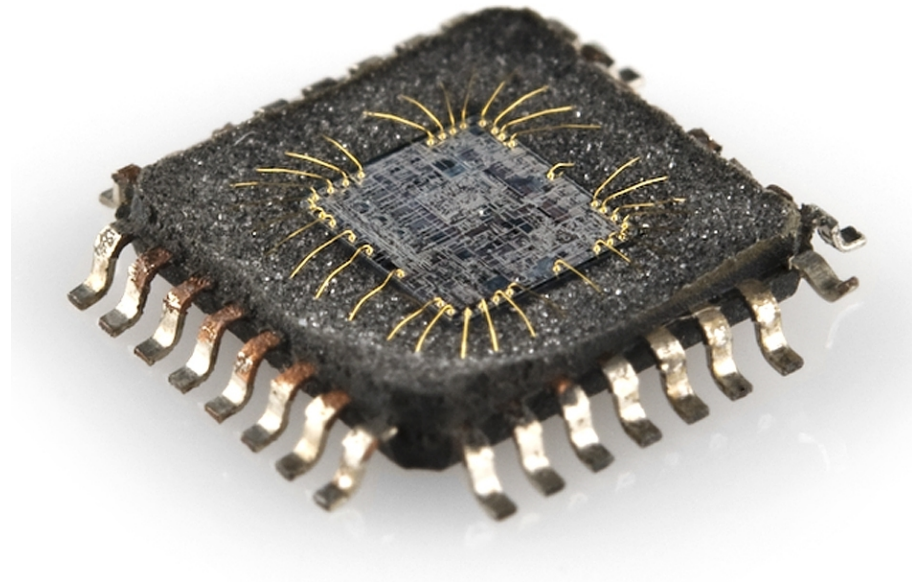
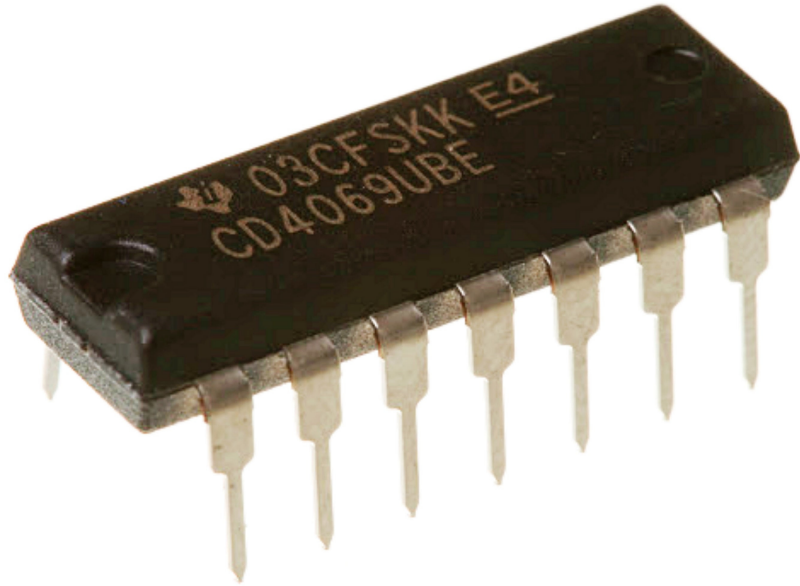
# Soldering time!

- To breadboard audio circuits, one needs to interface from breadboard pins to a common audio connector
- One way to do that is to solder loose wires to an audio jack
- Now we will learn to strip and solder the wires!

# Time to assemble your first audio circuit

- Audio circuits vary in complexity. The one we are building technically takes three parts:
  - *Resistor*
  - *Capacitor*
  - *Integral Circuit CD40106*
- The latter is, in fact, **a whole circuit** built inside one little package!
- Integral circuits are here to save you time and effort while building or designing electronics
- There's a lot of different circuits that can fit in the same package!

# Integral Circuits (ICs, chips)





# CD40106 squarewave generator

